Bizantine Capital

Neo-Commodities

The Base Layer of the Web 3.0 Stack

While Ether is very likely to become the biggest winner in crypto, usurping gold in the process, its competing blockchain-based commodities will assume roles as digital silver, digital bronze, etc.. Like Ether, these neo-commodities will live their metaphors based on the usefulness of their corresponding blockchains [1]. It is still too early to publicly project which Ether competitors will become which commodity metaphors. It is also too early to determine how steep crypto's Pareto distribution will be, but based on the network effects of both liquidity and security [2], the curve should be steep [3]. Nonetheless, these competing chains continue to ship technical updates to their protocols while simultaneously attempting to grow their communities.

However, it is much easier to deploy code than to develop communities on top of that code. Thus, most Ethereum competitors have struggled and/or failed to garner meaningful community adoption, but certain chains have successfully garnered adoption across specific industries or regions: Provenance has very quickly grown in the Home Equity Line of Credit (HELOC) market; Nodle, a future Polkadot parachain (Polkadot has yet to launch), is now processing over 1 million transactions per day in its Internet of Things (IoT) relay network; Icon's loopchains are quickly becoming adopted across numerous verticals in South Korea. Even if Ether assumes 95% of the value of all blockchain-based commodities [4], based on the future market size of these neo-commodities [5], there still exists trillions of dollars on the table for Ether competitors. Some of these competitors may even pose a better risk-adjusted return than Ether itself.

Measuring a Blockchain's Value: The Usefulness of its Smart Contracts

A blockchain is an encoded protocol, on top of which exists a network of smart contracts; the blockchain's protocol outlines the rules that these smart contracts play by. A blockchain's market capitalization is directly correlated to the usage, measured in liquidity, of the smart contracts built on top of it [6]. These smart contracts encode the conditions of value transfer across a wide variety of use cases (such as money markets, under-collateralized loans, insurance payouts, trade finance, and more), interacting both with other smart contracts and the applications that sit on top of smart contracts. The users of these applications only need to trust a smart contract's code; no middlemen are required for the functioning of a blockchain's value transfers [7].

Smart contract usage thus far has been overwhelmingly dominated by contracts on Ethereum. Below are Ethereum's most used smart contracts (The terms 'smart contracts' and 'layer-two protocols' are used interchangeably, as all layer-two protocols are a set of smart contracts. The blockchain itself is known as a layer-one protocol.).

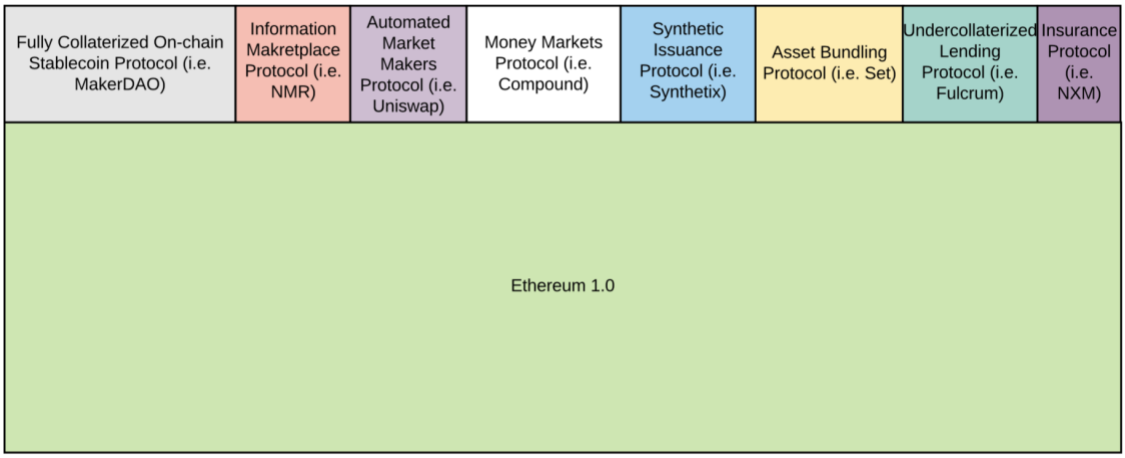

Image 1: Ethereum and its most used smart contracts

User applications must write (such as sending a transaction) and read (such as receiving an update that a transaction has been received) information to and from Ethereum's smart contracts. The process of reading and writing to smart contracts can be termed the 'querying'. Thus, the full Ethereum stack currently looks as follows:

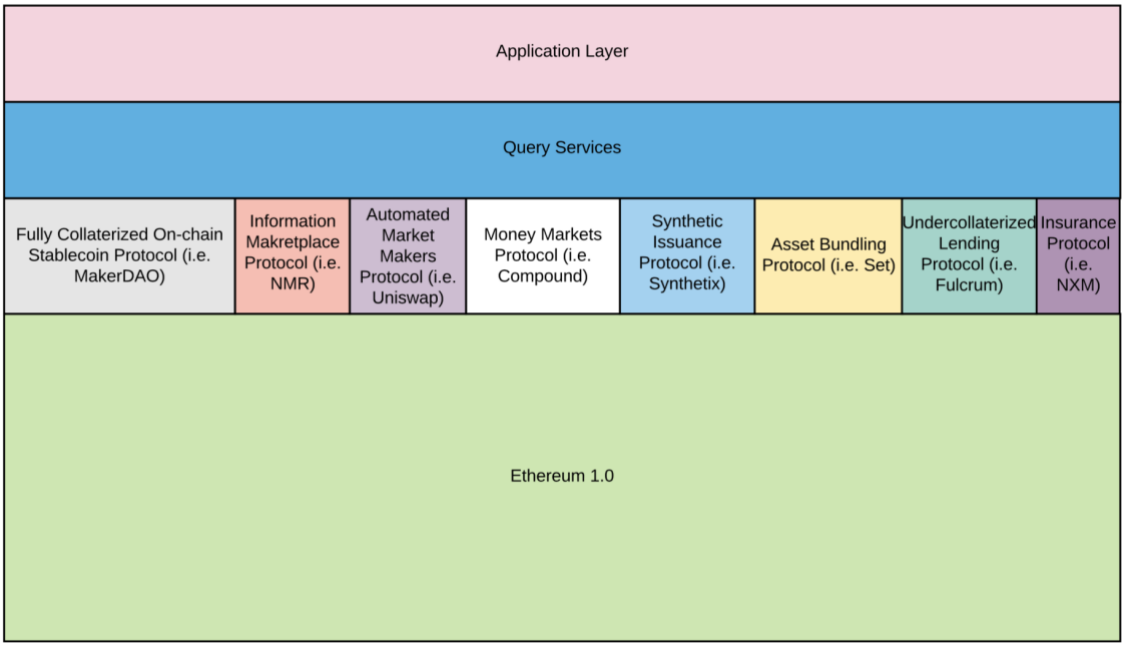

Image 2: Web 3.0 Stack, Ethereum Only

Other chains can attempt to copy the code from Ethereum's most used smart contracts, but other chains cannot copy the liquidity locked inside Ethereum's smart contracts. However, the liquidity of Ethereum's smart contracts recently proved to be a double-edge sword: as Ethereum's block space becomes increasingly demanded, Ethereum's efficiency becomes hindered. There was no better example than this than the recent market crash on March 12, when Ethereum's lack of mainstream scalability exacerbated the crash of Ether's price: users

were unable to quickly add additional collateral to their debt positions, causing their debt positions to become undercollateralized and consequently liquidated (further dropping Ether's price and causing more liquidations).

Scaling Ethereum via Sub-Chains

Thus, numerous Ethereum layer-two protocols are in the process of scaling Ethereum through sub-chains (namely rollups), optimized specifically for their layer-two protocol [8]. Layer-two protocols deployed on separate rollups lose the **strict composability** benefits of the current, albeit congested, Ethereum 1.0 chain. Strict composability refers to the ability for one contract to communicate with another within one block. **Weak composability** refers to the ability for one contract to communicate within three blocks [9]. Most applications do not require strict composability, with weak composability both adequate and still orders of magnitude more efficient than the incumbent financial system [10] [11].

In general, the decision (for a layer-two protocol to either have its own rollup, share a rollup with other layer-twos, or remain on the base layer) will follow marginal demand and marginal cost economics, as most free markets do: smart contracts will position themselves to best optimize that contract's utility/demand across the cost of operating the contract. As rollups/sub-chains are deployed, Ethereum will begin to form a hub-spoke model, with rollups as spokes and Ethereum 1.0 mainchain as the central hub.

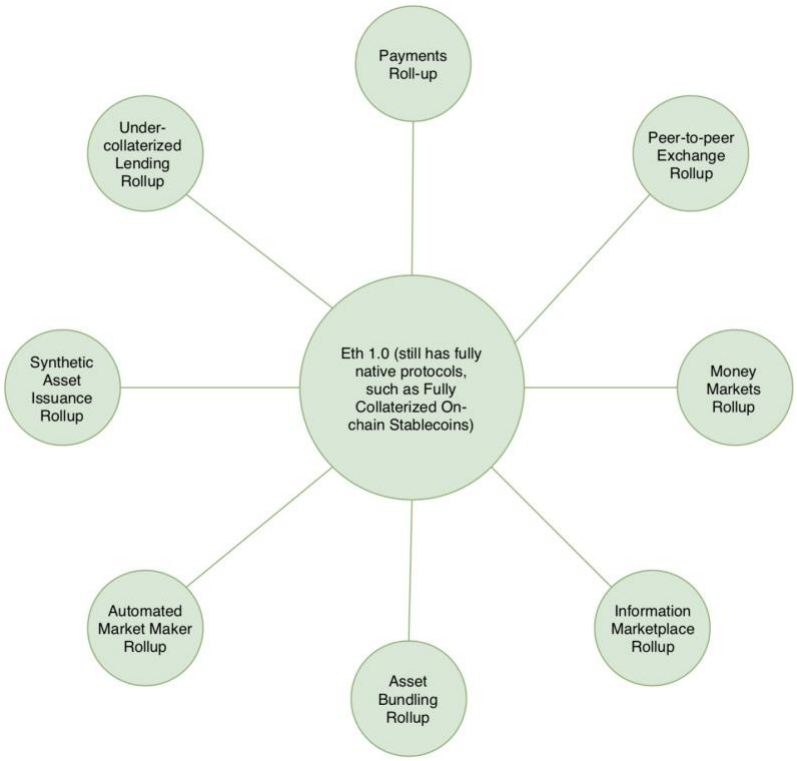

Image 3: Ethereum and its sub-chains

Ethereum competitors will also have their own intra-blockchain standards, allowing for their own versions of the above hub-spoke model. However, these Ethereum competitors will increasingly need to interoperate with Ethereum, due to Ethereum's increasing dominance of the decentralized finance sector; not interacting with Ethereum will significantly diminish the utility of these Ethereum competitors.

How Ethereum Competitors Will Enter

To interact with Ethereum, Ethereum competitors will need to follow some sort of interoperability standard. Ethereum will likely lead the launch of a widespread interoperability standards, as Ethereum competitors will have to play by Ethereum's rules to tap into Ethereum's liquidity [12] (unless the competing chain can garner enough liquidity in its smart contracts to force Ethereum to bridge to it, a low probability event). Additionally, interoperability is a high-cost endeavor: each blockchain must build a light client into a smart contract on the blockchain it is connecting to (just as rollups currently do on the Ethereum 1.0 mainchain).

The costs of deploying and operating these light-clients are paid by the less secure chain's users to the more secure chain's validators (which will often be Ethereum's validators). Thus, chains will only connect to a few other chains, for which the gains in utility/liquidity compensate for the cost of interoperability. Other than Ethereum, the chains that garner enough usage to render interoperability a worthwhile endeavor will be ones that optimize for specific industries and regions; these chains will be the most successful Ethereum competitors, with their native assets having the highest probability of becoming high-value digital commodities.

Industries

Certain intelligently-led chains are optimizing for a singular use case that will become crucial for decentralized finance and the decentralized web, while others are optimizing for a singular use case only vital to decentralized finance. The decentralized web will take significantly longer to become adopted than decentralized finance (and so is discussed less), due to the decentralized web's current substantial performance drawbacks. Nonetheless, prominent Web 2.0 leaders are already beginning to endorse the paradigm shift.

There exist certain protocols that will be important to both factions of the broader Web 3.0 landscape [13]; the most important decentralized web protocols, both in the near and long term, will be those that also serve decentralized finance (This is not a coincidence, but merely a property of protocols: the best protocols can be used across a wide range of applications.).

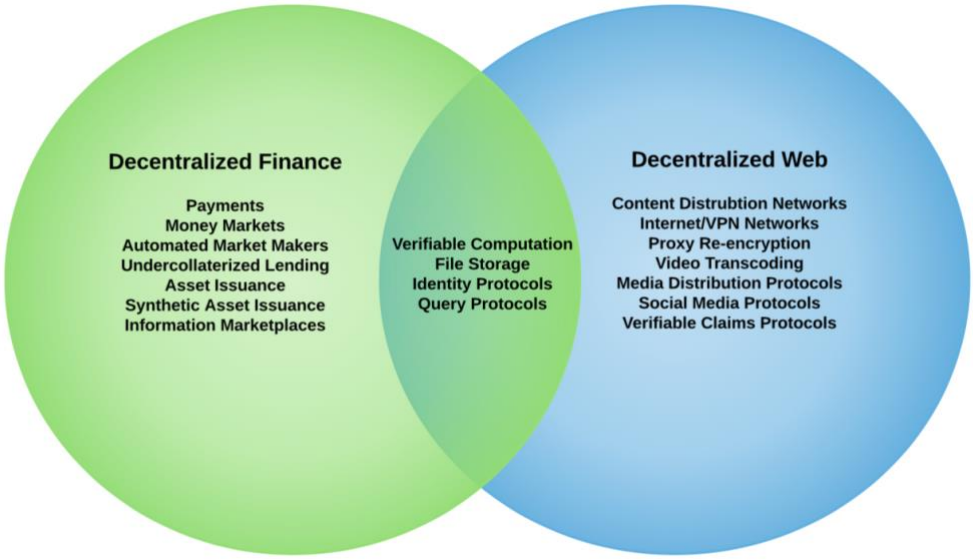

Image 4: Web 3.0 landscape, broken into Decentralized Finance and the Decentralized Web

File Storage and Compute

Both decentralized finance applications and decentralized web applications will rely on decentralized file storage. Filecoin has optimized its chain for file storage in such a way that it is an order of magnitude better than Ethereum's solution. Even though Filecoin is pre-launch, the protocol underpinning Filecoin, IPFS [14], has already garnered significant adoption by both protocols on Ethereum and third-party developers building tools specifically on IPFS. After its launch in the coming months, Filecoin itself will likely experience significant adoption due to the already large developer interest in IPFS. File storage is an extremely large market (projected to be $106 bn by 2024), and it is likely Filecoin could grow this market significantly. However, even if FIlecoin eventually dominates this market over ten years, at its current market valuation of $10bn, Filecoin does not pose as strong a risk-reward ratio as Ether.

Both decentralized finance applications and decentralized web applications will also rely on decentralized computation services. Decentralized computation is years behind decentralized storage due to secure enclave's vulnerabilities and the current shortcomings of the math behind secure multi-party computation and fully homomorphic encryption. There are numerous chains focused on decentralized computation, and, although there is still no clear leader, it is likely that a chain optimized for decentralized computation follows a similar success story as Filecoin's [15].

Finance-Only

Other Ethereum competitors are focusing solely on specific parts of the finance industry (neglecting the decentralized web), executing their use case an order of magnitude better than Ethereum. On their Provenance chain, Figure Technologies has issued over $150mn of HELOCs, optimizing their chain specifically to improve the efficiency of the HELOC securitization process.

$3trn of HELOCs were issued globally last year; if Provenance can dominate the issuance process of the market, it will be worth tens of billions. If Figure can expand Provenance beyond HELOC issuance into other high-volume financial products; Provenance's valuation could enter the range of hundreds of billions. However, at a current valuation of $1.2 bn, Provenance doesn't pose as attractive risk-reward as Ether's.

Other finance-driven chains have successfully optimized themselves for trade finance. E&Y's Baseline protocol, a collaboration with Fortune 50s that already heavily leverages the Ethereum mainchain, is newly launched but already shows significant promise in the sector [16]. Citi Bank's trade finance chain, komgo (a fork of Ethereum), also shows significant promise.

Regions

Other than targeting specific industries, another viable option for Ethereum competitors is to target specific regions/countries. This approach has worked well in a world that continues to become more nationalistic. The two most pertinent examples of region-chains are Icon and Conflux.

Icon's loopchains (Icon's version of sub-chains) have garnered adoption from leading municipalities , financial services companies, and public universities across South Korea. With South Korea's GDP at ~$1.5trn, if Icon is able to secure even a fraction of the country's economy, it will be worth at least tens of billions, if not hundreds of billions. At a current valuation of ~$100mn, depending on your projections for Icon's adoption within Korea, its risk-adjusted return could surpass Ether's.

Conflux is a Chinese chain led by some of the top Chinese computer scientists. The chain has officially partnered with the city of Shanghai to incubate projects that improve Shanghai's transportation, finance, and healthcare sectors. If successful, one could imagine other Chinese cities implementing Conflux's solutions developed for Shanghai. However, due to the general opacity of the Chinese economy and the high likelihood that the current Chinese regime will not publicly endorse public blockchain technology (instead focusing on private blockchain technology), it is difficult to evaluate the risk-reward ratio of an investment in Conflux.

Both Icon and Conflux are attempting to expand beyond the regions they dominate. However, they will likely stumble outside of their regions, as Ethereum continues to amass the majority of independent developers due to the chain's increasingly compounding network effects. Ethereum has garnered more third-party adoption even inside Korea and China than both Icon and Conflux (Ethereum's founder, Vitalik Buterin, learned Mandarin in three months several years ago to grow Ethereum in the region.).

Regional chains are successful for the same reason that industry chains are: these chains have heightened competency in attracting institutions, due to the strong institutional relationships of their founders, and consequently can customize their chains specifically for their client institutions.

A Lack of Direction Hurts Even the Most Technically Innovative

There are other chains that are more technically innovative than a majority of the aforementioned industry and regional chains. However, these more innovative chains' lack of institutional adoption may become an insurmountable mistake. There is no better example of this than Polkadot, who has one of the most technically sound teams in the space but may fail because being an Ethereum competitor without an industry or regional focus is simply too difficult.

No future parachains (Polkadot's version of sub-chains) have garnered significant enterprise or community adoption. Currently, only one of Polkadot's parachains promises to achieve adoption due to its innovative solution to bringing IoT devices online, Nodle Inc. [17]. However, even if Nodle becomes a dominant player in the global IoT market (becoming worth tens, if not hundreds of billions of dollars), Polkadot's other parachains would need to see significant adoption for Nodle to stay in the Polkadot network. If other parachains have little adoption, there is no need for Nodle to pay rent to Polkadot's validators to be part of the broader Polkadot network; it would be more cost effective for Nodle to simply secure their own chain with only their own validators.

While Polkadot is the number one Ethereum competitor for third-party developers (due to the reputation of its founder, Ethereum's former CTO, and the technical prowess of the rest of the team), its failure to focus on one specific industry may be its ultimate reason for failing. It cannot usurp Ethereum as market leader [18], and may be stuck in the middle where its technology is wonderful but its adoption is scarce. At its current $1.2 bn valuation, if one believed that it was 10% as likely as Ether to become digital gold, its risk-adjusted returns would be equal to Ether's. However, it is likely that Polkadot has less than a 10% probability of usurping Ethereum. No matter how strong an Ethereum competitor is technically, a blockchain is only worth as much as the community on top of it [19].

The Network of Chains

Now that we've established which Ethereum competitors could assume significant market share, either through industry/region adoption or in the unlikely event they usurp Ethereum, we can illustrate our projected network of blockchains. This network is composed of Ethereum and Ethereum's sub-chains, as well as these Ethereum competitors and their corresponding sub-chains (should they implement sub-chains). Due to the non-trivial cost of interoperability and the network effects around security, liquidity, and community growth, it is likely that the blockchain ecosystem will look as follows in the near-term (The circle sizes are rough estimates for value held, not meant to be taken to scale.).

Image 5: Network of Blockchains (pre-Eth 2.0)

Ethereum is in the process of upgrading from Ethereum 1.0 to Ethereum 2.0 [20]. Ethereum 2.0 has three well-established phases: Phase 0, Phase 1, and Phase 2, each of which will incrementally change our projected network

Ethereum 2.0 Phase 0

As Ethereum transitions to Ethereum 2.0 Phase 0 this summer, our projection of the network of chains will not evolve, as, in Phase 0, Ethereum 2.0's Beacon chain will not interoperate with any other chains besides the Ethereum 1.0 mainchain.

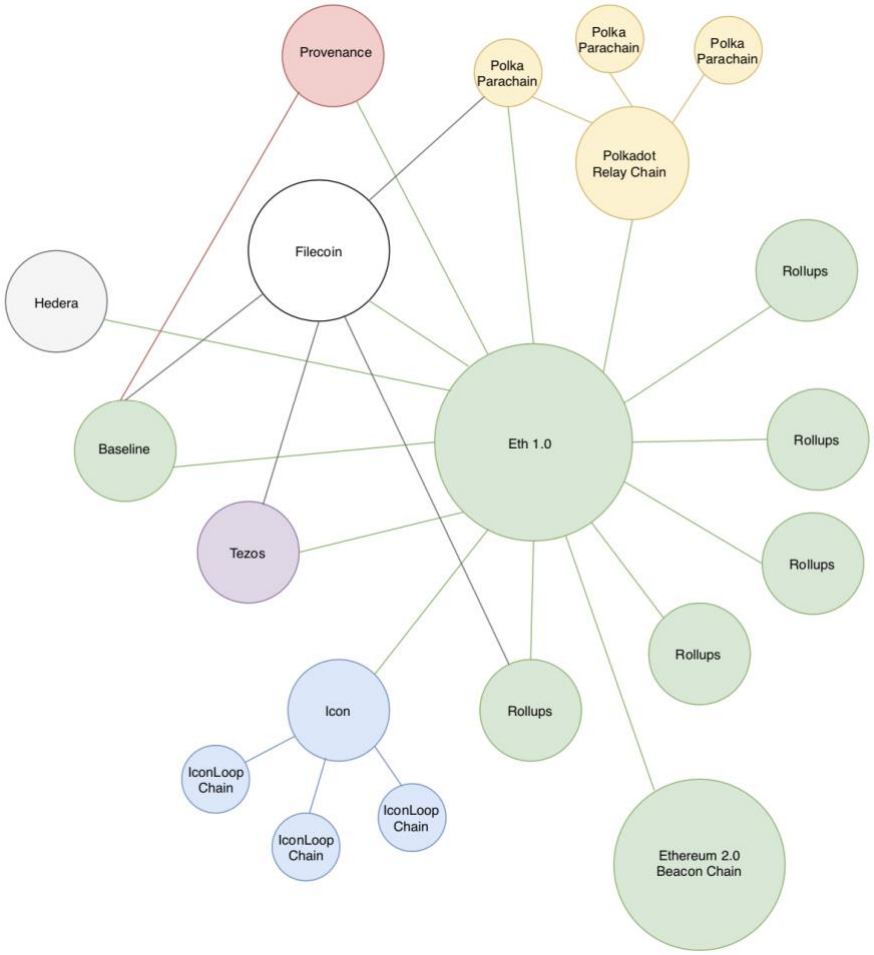

Image 6: Network of Blockchains (Eth 2.0 Phase 0)

Ethereum 2.0 Phase 1

Once Ethereum 2.0 enters Phase 1 of its development, Ethereum 2.0's beacon chain will become interoperable with a group of Ethereum neo-sub-chains known as shards (Ethereum 1.0 will become Shard 0 of Ethereum 2.0. Rollups will then exist on top of shards.). Initially, shards will be unable to interoperate with chains outside of the Ethereum ecosystem, as their expressability will be limited to the verification of the other subcategory of Ethereum sub-chains (rollups) and simple transfers, such as sending Ether. At Phase 1's completion, it is likely that numerous rollups move from the Ethereum 1.0 shard to other shards, as the fees for operating on these shards will likely be significantly less than Eth 1.0's (due to still high demand for Eth 1.0 block space).

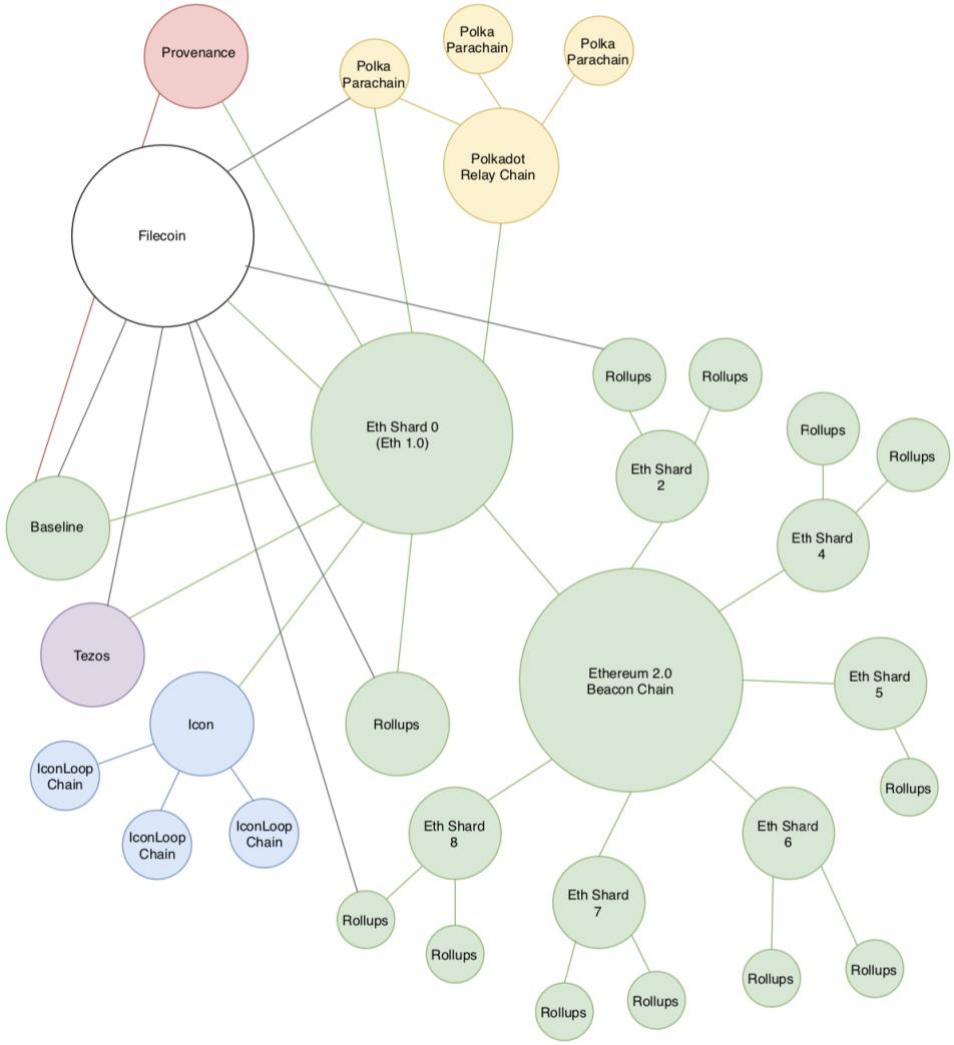

Image 7: Network of Blockchains (Eth 2.0 Phase 1)

Ethereum 2.0 Phase 2

Once Ethereum 2.0 enters Phase 2 of its development, Ethereum's shards will be able to interoperate with Ethereum competitors, which would bring to an end Ethereum 1.0's burden as being the most used Ethereum shard, instead dispersing the workload across multiple shards.

As Ethereum evolves, a robust hub and spoke model will increasingly take shape, with a central hub in Ethereum securing the entire system. This system will underpin digital finance and, later on, the decentralized web (Although a decentralized computation chain was not drawn, due to a lack of a clear winner. Numerous chains were left out for simplicity's sake.).

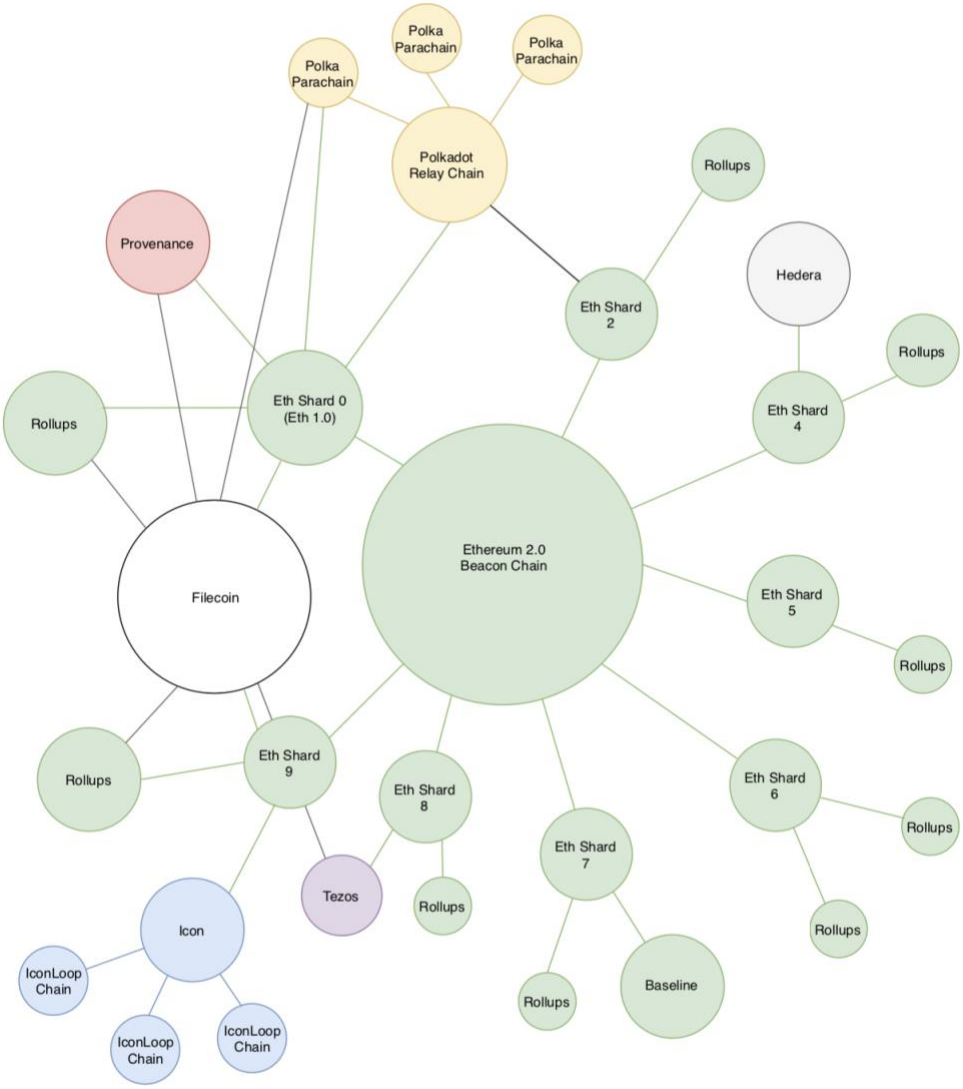

Image 8: Network of Blockchains (Eth 2.0 Phase 2)

Conclusion

Ethereum's network effects among both developers and its smart contract's liquidity continue to compound. It has become increasingly difficult for chains to usurp Ethereum as the market leader, making Ether the clear favorite to become digital gold. However, other coins can still compete to become secondary and tertiary digital commodities, ready to assume the role of industry leader should Ethereum suffer an idiosyncratic black swan event. An overwhelming majority, if not all, of Ether's successful competitors will be the chains that can focus and dominate a specific use case or region. As an active investor, some of these competitors may pose better risk-adjusted returns than Ether, although these will be a select few. As a passive investor, Ether poses the best way to be exposed to public blockchain technology, with upside projections asymmetric to its downside. Sub-chains on Ethereum and Ethereum competitors

will form an increasingly robust hub-spoke model, optimized to reduce the costs necessary to underpin decentralized finance and, eventually, the decentralized web.

Endnotes

[1] A blockchain's usefulness determines its minimal viable inflation rate (the lowest inflation rate necessary to maintain an adequate security level); investors currently seek commodities based on their inflation rate, and this paradigm will not change: the only change will be that the inflation rate of these neo-commodities will be determined by their usefulness (unlike physical commodities).

[2] Liquidity begets liquidity: the chain with the liquidity in its lending pools, money markets, automated market makers, peer-to-peer exchanges, etc. will continue to grow its liquidity in these areas, while chains without liquidity in those areas will see little to no growth. Security also begets security: the chain with the greatest security (measured through capital staked in Proof of Stake, hash rate in Proof of Work, and file storage in Proof of SpaceTime) will attract more developers and enterprises, generating more fees for its miners and consequently increasing security.

[3],[4] Google assumes 90% of the market capitalization of search engines. Blockchains will follow a similar, if not more steep, pattern, due to [2].

[5] The market size of blockchain-based commodities will likely be tens of trillions of dollars, as these neo-commodities both replace and grow the market for physical commodities (~20 trillion).

[6] There are exceptions to the rule: Bitcoin, due to first-mover advantages, is still the market leader, despite only allowing for the transfer of the Bitcoin currency. While Bitcoin currently has a ~7x higher market capitalization than Ethereum, Bitcoin is and, barring significant changes to the Bitcoin community's culture and roadmap, will continue to be only exceptional at storing and moving only the bitcoin currency. The Bitcoin community acknowledges that this is currently a very small market. They understand that Bitcoin's long-term security is dependent on bitcoin transactions not becoming a very small market. However, massive consumer behavior changes (from paying in fiat currencies into paying with digital gold) is a low probability outcome, and Bitcoin's future security is dependent on it: if transaction demand does not increase on Bitcoin, Bitcoin will be forced to raise its price per transaction significantly to pay miners, which will likely further reduce transaction demand, creating a spiral that ultimately leads to Bitcoin collapsing.

[7] Consequently, finance conducted on blockchains (often termed decentralized finance) allows for orders of magnitude improvements in the efficiency and openness of financial transactions (Openness meaning anyone, not just the half of the world with bank accounts, can partake in this new system.). Decentralized finance grew 67% this past year. Before the recent Ether price crash, its annual growth rate was 300%. The open-source nature of blockchain

protocols and their smart contracts allows for faster feature growth than close-sourced systems; contributors globally need not ask for any permission to build on or access these systems, similar to how no one needs to ask YouTube if they can post a video. The ability for fast feature growth has played a large role in decentralized finance's fast user growth.

[8] The current version of Ethereum, Eth 1.0, will become a sub-chain of Ethereum after sharding is implemented in Ethereum 2.0 Phase 1, although rollups are the most near-term/relevant form of Ethereum-based sub-chains. Some rollups may have their own token that their validators must stake, while others will allow their validators to stake Ether.

[9] Rollups will be able to communicate within two to three blocks due to credit markets.

[10] For example, money markets (which are over-collateralized loans) do not require strict composability with under-collateralized loans, and thus these two layer-two protocols could exist more efficiently on separate rollups within Ethereum. They would still hold weak composability, meaning they could communicate within three blocks (~39 seconds, still multiple orders of magnitude improvement over the current financial system).

[11] Use cases with meaningful adoption that require strict composability of layer-two protocols will either share a rollup or remain on the Eth 1.0 base layer, thus allowing users to still have frictionless access to that use case. Additionally, certain layer-two protocols may add specific features from other layer-two protocols, so as not to lose that use case as they transition to a rollup-driven architecture. For example, it would not be surprising to see numerous layer-two protocols implement flash loans, due to the ease of deploying this feature and the utility flash loans provide to their use case. Lastly, certain primitives that are useful across all rollups, such as Fully Collateralized On-Chain Stablecoins (FCOSs), will likely remain on the Ethereum 1.0 base layer; remaining on the base layer minimizes the friction for other layer-two protocols, both on rollups and on the base layer, to access the primitive.

[12] Ethereum will likely either allow competing chains to conform to similar standards as Ethereum's sub-chains, or piggy-back off the open-source work of more focused interoperability protocols, namely Polkadot and Cosmos, implementing some version of their standards.

[13] For example, digital wallets will store a user's private transaction history in a decentralized file system and then use a decentralized compute service to assess that user's credit history.

[14] Filecoin is an incentive layer, for the storage and retrieval of files, built on top of IPFS, which is the protocol for how files are actually stored in the network.

[15] Eventually, the advent of decentralized storage and decentralized computation will not only further the adoption of decentralized finance, but will also unbundle the cloud monopolies of today (Amazon Web Services, Google Cloud, Microsoft Azure, etc.), whose primary services are storing data and allowing computation on that data.

[16] Of the Ethereum competitors described thus far, Baseline is the only one that currently interoperates with Ethereum.

[17] Nodle is a San Francisco based startup that allows for the efficient and frictionless relay of currently trapped IoT data.

[18] Polkadot's primary design improvement was to allow developers to easily create 'parathreads/parachains' (similar to layer-two solutions on Ethereum) with customized state transition functions, which, a year ago, would have been a massive design improvement over Ethereum. However, this incremental design improvement by Polkadot has already been matched by layer-two developers on Ethereum. Ethereum's layer-two developers are already launching chains secured by Ethereum but using a different virtual machine than the EVM (instead using a virtual machine more optimized for their specific application). This was Polkadot's greatest design enhancement, and Ethereum's community was able to launch it before Polkadot, despite Polkadot being able to hypothetically move faster and break more things. The compounding nature of Ethereum's developer community will make it nearly impossible for Polkadot and chains like it to assume any significant market share among third-party developers.

[19] This is largely due to the open-source nature of blockchain code; there are no defensible patents.

[20] Ethereum 2.0 will scale Ethereum enough to allow for it successfully underpin a majority of the world's value transfers.